



# Journal of Biological Sciences

ISSN 1727-3048

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## Research Article

# Non-timber Forest Products (NTFPs): A Viable Option for Livelihood Enhancement in the Eastern Cape Province, South Africa

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## Abstract

**Background and Objective:** Non-timber forest products (NTFPs) are renewable natural resources which are harvested by local communities from the surrounding homesteads, fields, grazing lands, woodlands, grasslands and natural habitats. The aim of this study was to examine the use of NTFPs in Alfred Nzo District Municipality in the Eastern Cape province in South Africa, assessing their consumption patterns and contribution to the household well-being. **Materials and Methods:** Data on NTFPs identities and utilization in the study area were gathered through community focus group discussions and household surveys using both structured and semi-structured questionnaires between April, 2017 and May, 2018. A sample of 124 participants selected via snowball-sampling technique provided detailed accounts on diversity and utilization of NTFPs in the study area. **Results:** A total of 59 species and eight extractable NTFPs were utilized by the communities in Alfred Nzo District Municipality. The identified eight use categories were herbal medicines (39.0%), edible plants and mushroom (18.0%), firewood (11%), bushmeat (10.0%), forage (9.0%), construction materials (6.0%), ceremonial uses (2.0%) and others with miscellaneous uses (5.0%). Popular NTFPs with Relative Frequency Citation (RFC) values exceeding 0.50 included *Agapanthus africanus*, *Aepyroceros melampus*, *Bulbine frutescens*, *Bulbine latifolia*, *Centella asiatica*, *Clivia miniata*, *Datura stramonium*, *Dicerotheramnus rhinocerotis*, *Elephantorrhiza elephantina*, *Hypoxis hemerocallidea*, *Leonotis leonurus*, *Pavo cristatus*, *Struthio camelus* and *Xerus inauris*. **Conclusion:** In this study, it was concluded that information on diversity, consumption patterns and contribution of NTFPs to livelihood needs of households may enable policymakers and government officers to draft policies required for sustainable utilization and management of NTFPs.

**Key words:** Alfred Nzo District Municipality, Eastern Cape province, non-timber forest products, sustainability

**Citation:** Zingisa Thinyane and Alfred Maroyi, 2019. Non-timber forest products (NTFPs): A viable option for livelihood enhancement in the Eastern Cape province, South Africa. *J. Biol. Sci.*, 19: 248-258.

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## **INTRODUCTION**

The term non-timber forest products (NTFPs) is used to refer to all biological materials other than timber which are extracted from forests or natural environments for human use<sup>1</sup>. The NTFPs can be categorized into food, forage, medicinal products, construction materials, utensils, bio chemicals, aromatics and ornamentals<sup>2</sup>. The NTFPs are regarded as renewable resources which encompass a wide range of wild and semi-domesticated biological resources harvested by local households and communities from the surrounding environment, fields, grazing lands and relatively intact vegetation, including but not limited to forests, woodlands, grasslands and natural habitats<sup>3,4</sup>. Different types of NTFPs have been developed over the years in response to different environmental factors. Some of the NTFPs adapt to several severe and extreme environmental and climatic conditions, supplying local communities with different ecosystem goods and services. Research has revealed that the livelihoods of rural, subsistence societies living in and around forests are intimately connected to NTFPs procured from these ecosystems and access to these resources is necessary for sustaining livelihood practices and preserving important cultural, commercial and spiritual activities of local communities<sup>5</sup>.

Globally, 1.5 billion people use or trade NTFPs with the majority of NTFP use and trade occurring at local and regional scales and this information is generally invisible to researchers and policymakers<sup>6</sup>. Policies for sustainable economic development based on the trade and consumption of NTFPs are largely absent even in countries where these resources are widely used<sup>7</sup>. These authors also argued that NTFPs cannot be measured by monetary estimations alone as they have significant subsistence and socio-cultural importance and are a component of a multifaceted and adaptive livelihood strategy in developing countries. Research in Zimbabwe showed that NTFPs are a vital component of people's everyday livelihood needs, providing energy, food for household consumption, herbal medicines and raw materials for building houses and animal enclosures, agricultural tools and implements<sup>8</sup>. Considering these different roles played by NTFPs, the sustainable use of these biological resources can make a significant contribution to the livelihoods of local communities and help such communities to fight poverty<sup>9</sup>. The ordinary people throughout the world are utilizing and managing NTFPs in ways aimed at improving their standard of living<sup>10</sup>. Despite their importance and everyday use, comprehensive

knowledge on the ecology and socio-economic value of NTFPs is largely lacking, hindering the ability to monitor, regulate and manage them. A clear understanding about the condition of provisioning services provided by NTFPs is necessary and such information is derived from both the resource use patterns of the people who are most reliant on those services, as well as the utility of the NTFPs exploited by local people. Therefore; in this study, the role and uses of NTFPs in the livelihoods of communities in Alfred Nzo District Municipality in the Eastern Cape province in South Africa were evaluated.

## **MATERIALS AND METHODS**

The study was conducted in Alfred Nzo District Municipality in the Eastern Cape province, South Africa (Fig. 1). The research study focused on three local municipalities, that is, Mbizana, Mzimvubu and Ntabankulu (Fig. 1). Alfred Nzo District Municipality is located between longitude 29°20' E to 30°10' E and latitude 30°60' S to 30°30' S at an altitude ranging from 0-1055 m above sea level. The temperature varies from 7-10°C in cool dry season, when it can also be snowy and from 18-24°C in the hot wet season. The rainfall season is between October and March with the latter being the wettest month and rainfall varies from 750-1050 mm per annum<sup>11</sup>. It was described by few researchers that the dominant vegetation of Alfred Nzo District Municipality as sub-escarpment grassland and sub-escarpment Savanna bioregions dominated by moist grasslands and *Acacia* species<sup>12</sup>.

The majority of communities in Alfred Nzo District Municipality are pre-dominantly rural with the dominant land use practice being rearing of livestock and dry land crop production. The residents raise goats together with other livestock species such as cattle, sheep, chickens and pigs<sup>11</sup>. The arable lands are typically consolidated rain fed farming areas. With high levels of poverty, low levels of economic activity and the poor quality of land allocated to households in Alfred Nzo District Municipality, non-farm activities are potentially an important source of livelihood for the residents. Local people rely primarily on river and rainwater, while fuel wood and paraffin constitute the primary energy sources<sup>13</sup>. The majority of the inhabitants (at least 87%) in the study sites are traditional isiXhosa speaking people who are highly dependent on natural resources for their livelihood needs<sup>14,15</sup>.

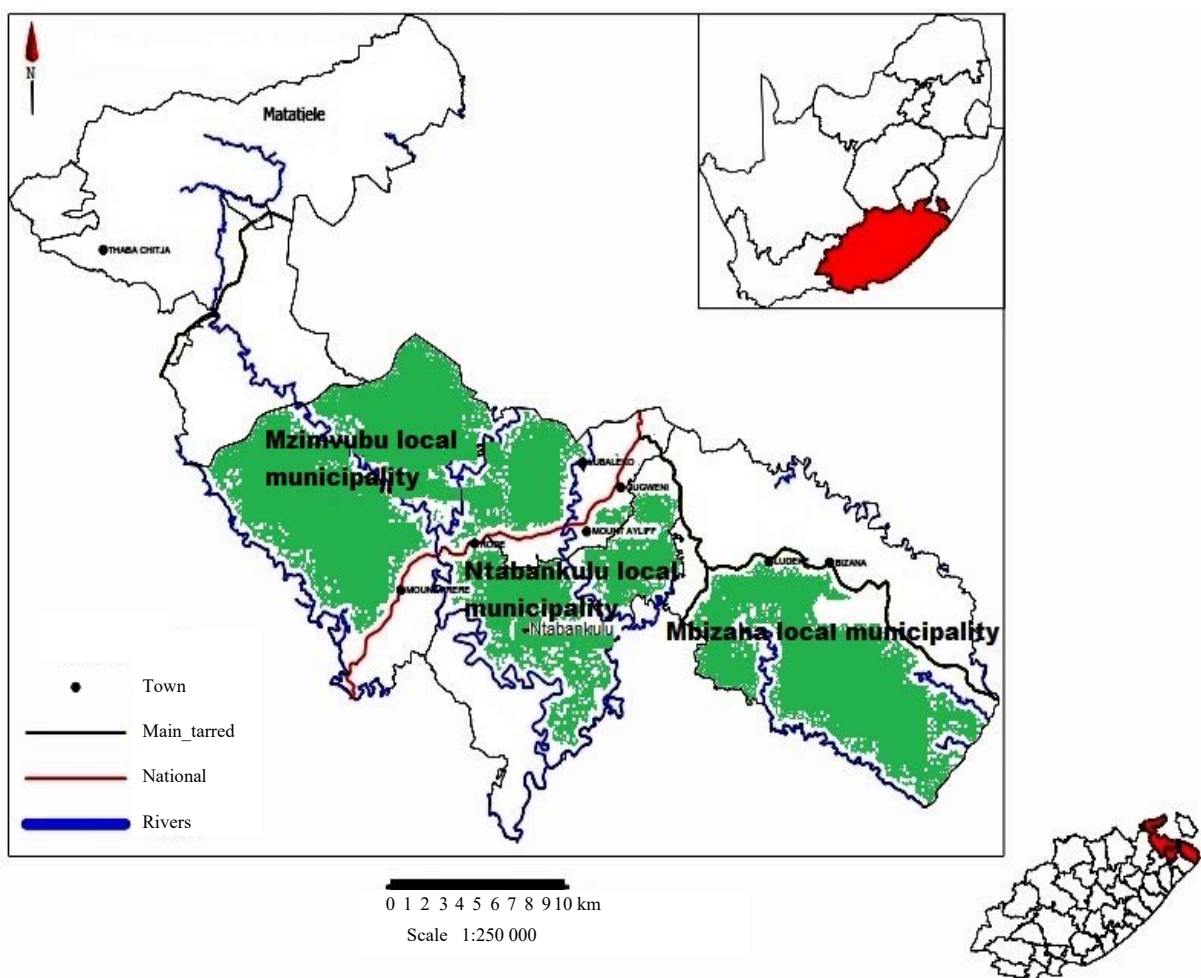


Fig. 1: Map of South Africa showing the geographical position of the study areas in Alfred Nzo District Municipality  
Source: Maroyi<sup>15</sup>

**Data collection:** The study was conducted between April, 2017 and May, 2018 focusing on ethno-biological surveys, conducting interviews with 124 participants, focus group discussions with community members, local leadership, government workers in the Departments of Environmental Affairs, Tourism, Economic Development, Agriculture and Forestry and Fisheries. Interviews were conducted using both structured and semi-structured questionnaires. The questionnaires were designed to collect information on various aspects associated with household use of NTFPs and also their future impact on socio-economic development in the Eastern Cape province. Two data collection techniques, namely, snowball or chain-referral-sampling<sup>16</sup> and Participatory Rural Appraisal (PRA)<sup>17</sup> techniques were used. Structured and semi-structured interviews were carried out in isiXhosa, a language spoken by all participants. In order to ensure that participant's right

to voluntarily decide to participate in this research on NTFPs, all participants were encouraged to sign a consent form, after the researcher or research assistants had fully explained the nature of research work and acknowledged indigenous prior rights of the participants. The NTFPs were initially identified by participants using their vernacular names, Xhosa names. Voucher specimens of utilized plant species with fruits, leaves, pods and flowers were collected and processed using standard taxonomic procedures and incorporated into the Giffen Herbarium, University of Fort Hare, as reference material.

**Data analysis:** The collected data were carefully reviewed and assessed for accuracy, credibility, validation and reliability by the researcher prior to the analyses. The data were then analyzed based on the information received from the local respondents using descriptive statistics such

as frequencies, Microsoft Excel and Statistical Package for the Social Sciences (SPSS). Determined the Relative Frequency of Citation (RFC) of reported plant species using the following equation:

$$RFC = FC/N; (0 < RFC < 1)$$

This index shows the local importance of each species and is given by the Frequency of Citation (FC) that is the number of informants mentioning the use of species divided by the total number of informants participating in the study<sup>18</sup>.

## RESULTS

**Diversity of NTFPs:** A total of 59 species and eight extractable NTFPs utilized in Alfred Nzo District Municipality are presented in Table 1 and Fig. 2. The identified use categories included herbal medicine (39.0%), edible plants and mushroom (18.0%), firewood (11.0%), bushmeat (10.0%), forage (9.0%), construction material (6.0%), ceremonial uses (2.0%) and others with miscellaneous uses (5.0%). An edible mushroom species, *Daucus carota* L. (carrot) characterized by edible taproot, five leafy vegetable species and 10 other species characterized by edible fruits were recorded in this study. Nine animal species were used as sources of bushmeat. Ten species were used as sources of firewood while 8 species were used as forage. Six species were used as construction materials while *Helichrysum pedunculatum* Hilliard and B.L. Burt and *Helichrysum odoratissimum* (L.) Sweet were burnt

during ceremonial services. Species with other miscellaneous uses included *Agapanthus africanus* L. Hoffmanns used as an ornamental species, *Dicerotheramnus rhinocerotis* L.f. Koekemoer (fumigant), *Helichrysum odoratissimum* (fumigant and insect repellent) and *Typha capensis* (Rohrb.) N.E.Br. (hand brooms and craft work). Popular NTFPs with relative frequency citation (RFC) values exceeding 0.50 included *Agapanthus africanus*, *Aepyros melampus*, *Bulbine frutescens*, *Bulbine latifolia*, *Centella asiatica*, *Clivia miniata*, *Datura stramonium*, *Dicerotheramnus rhinocerotis*, *Elephantorrhiza elephantina*, *Hypoxis hemerocallidea*, *Leonotis leonurus*, *Pavo cristatus*, *Struthio camelus* and *Xerus inauris*.

**Perceived importance of NTFPs:** The importance of NTFPs in Alfred Nzo District Municipality was ubiquitously perceived, with all respondents reporting their contribution towards their livelihoods, traditional medicine, cultural heritage and environmental protection (Table 2). The search for herbal medicines were ranked first (86.3% of the participants), followed by use of NTFPs as wild foods, which involved collection of wild leafy vegetables, edible roots, mushroom, edible fruits, fish, birds, insects and animals (77.4%). The search for construction materials in the form of poles, thatching grass, branches used for constructing houses, rooftrusses, animal enclosures and fences was ranked third by 54.8% of the participants, while firewood was scored 51.6%. The sales of raw and manufactured products such as baskets, mats, carvings and fruits were scored 49.2% while use of NTFPs as forage and grazing for livestock were scored

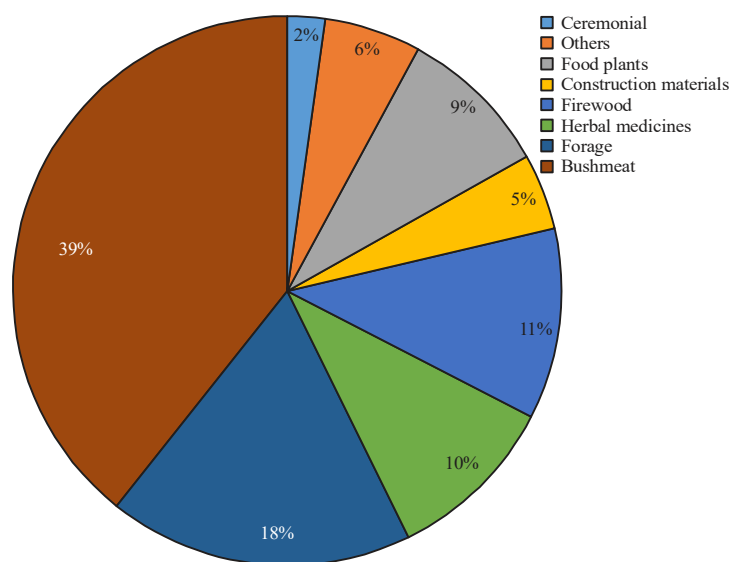


Fig. 2: Non-timber forest products (NTFPs) identified in Alfred Nzo District Municipality

Table 1: List of NTFPs collected in Alfred Nzo District Municipality

Scientific name and family	Xhosa name	Part(s) used	Uses	RFC
<b>Herbal medicines</b>				
<i>Agapanthus africanus</i> (L.) Hoffmanns, Agapanthaceae	Isicakathi	Leaves and roots	Herbal medicine	0.85
<i>Agaricus subrufescens</i> Peck, Agaricaceae	Ikhowa	Fruiting bodies	Herbal medicine	0.13
<i>Alepiidea amatymbica</i> Ackl. and Zeyh., Apiaceae	Iqwili	Leaves	Herbal medicine	0.37
<i>Aloe ferox</i> Mill., Asphodelaceae	Ikhalala and Umhlaba	Leaves	Herbal medicine	0.40
<i>Aloe greatheadii</i> Schönland var. <i>davyana</i> . (Schönland) Glen and D.S. Hardy, Asphodelaceae	Inkala	Leaves	Herbal medicine	0.25
<i>Aloe vera</i> (L.) Burm f., Asphodelaceae	Intaba	Leaves and stems	Herbal medicine	0.31
<i>Aloiampelos ciliaris</i> (Haw.) Klopper and Gideon F. Sm. var. <i>ciliaris</i> , Asphodelaceae	Ishlungu	Leaves	Herbal medicine	0.39
<i>Artemisia afra</i> Jacq. ex Willd., Asteraceae	Umhloniyane	Leaves and stems	Herbal medicine	0.22
<i>Bulbine frutescens</i> (L.) Willd., Asphodelaceae	Ibhucu	Leaves and roots	Herbal medicine	0.51
<i>Bulbine latifolia</i> (L.f.) Spreng., Asphodelaceae	Incelwani, Ibhucu	Whole plant	Herbal medicine	0.64
<i>Gaesalpinia decapetala</i> (Roth) Alison, Fabaceae	Bobo	Fruits and stems	Herbal medicine	0.20
<i>Cannabis sativa</i> L., Cannabaceae	Somntsangu	Leaves and twigs	Herbal medicine	0.28
<i>Catharanthus roseus</i> (L.) G. Don, Apocynaceae	Ishlungu	Leaves	Herbal medicine	0.26
<i>Centella asiatica</i> (L.) Urb., Apiaceae	Udingu	Leaves and roots	Herbal medicine	0.58
<i>Civina miniata</i> (Lindl.) Regel var. <i>miniata</i> , Amaryllidaceae	Umayime	Leaves	Herbal medicine	0.52
<i>Coryza scabrada</i> DC., Asteraceae	Isavu	Leaves	Herbal medicine	0.24
<i>Datura stramonium</i> L., Solanaceae	Ijoyi and umhlavavuthwa	Leaves	Herbal medicine	0.94
<i>Dicerotheramnus rhinocerotis</i> (L.f.) Koekemoer, Asteraceae	Umlingatho	Leaves and roots	Herbal medicine	0.69
<i>Dicoma capensis</i> Less, Asteraceae	Ucelezi and umuna	Leaves	Herbal medicine	0.47
<i>Elephantorrhiza elephantina</i> (Burch.) Skeels, Fabaceae	Intolwane	Leaves and roots	Herbal medicine	0.56
<i>Foeniculum vulgare</i> Mill., Apiaceae	Imboziso	Leaves	Herbal medicine	0.27
<i>Helichysum odoratissimum</i> (L.) Sweet, Asteraceae	Impepho and isiqhumiso	Leaves and stems	Herbal medicine	0.49
<i>Helichysum pedunculatum</i> Hilliard and B.L. Burtt, Asteraceae	Impepho	Leaves and stems	Herbal medicine	0.15
<i>Hypoxis hemerocallidea</i> Fisch., C.A. Mey and Avé-Lall, Hypoxidaceae	Inkomfe	Leaves	Herbal medicine	0.67
<i>Leonotis leonurus</i> (L.) R. Br., Lamiaceae	Imfamicane	Leaves and roots	Herbal medicine	0.75
<i>Lippia javanica</i> (Burm. f.) Spreng., Verbenaceae	inziziniba	Leaves and stems	Herbal medicine	0.23
<i>Malva parviflora</i> L. var. <i>parviflora</i> , Malvaceae	Ujongelana	Leaves and roots	Herbal medicine	0.14
<i>Mentha longifolia</i> (L.) L., Lamiaceae	Inxina	Leaves and stems	Herbal medicine	0.12
<i>Prunus persica</i> (L.) Batsch, Rosaceae	Ipesika	Leaves and stems	Herbal medicine	0.31
<i>Psidium guajava</i> L., Myrtaceae	Gwava	Fruits	Herbal medicine	0.36
<i>Rumex lanceolatus</i> Thunb., Polygonaceae	Idololenkonyane and Inkonyane	Leaves and stems	Herbal medicine	0.40
<i>Solanum nigrum</i> L., Solanaceae	Umsobo	Leaves and stems	Herbal medicine	0.43
<i>Tecoma capensis</i> (Thunb.) Lindl., Bignoniaceae	Umsilingi	Leaves and stems	Herbal medicine	0.19
<i>Typha capensis</i> (Rohrb.) N.E.Br., Typhaceae	Ingcongolo	Leaves and roots	Herbal medicine	0.30
<i>Zantedeschia aethiopica</i> (L.) Spreng., Araceae	Inyiba	Leaves and stems	Herbal medicine	0.49

Table 1: Continue

Scientific name and family	Xhosa name	Part(s) used	Uses	RF <sup>c</sup>
<b>Edible plants and mushroom</b>				
<i>Agaricus subrufescens</i>	Ikhowa	Fruiting bodies	Fruiting bodies edible	0.13
<i>Beta vulgaris</i> L., Amaranthaceae	Bhetruthi	Leaves and taproot	Edible leaves and taproot	0.02
<i>Bidens pilosa</i> L., Asteraceae	Umhlabangulo and Ucadolo	Leaves	Leafy vegetable	0.06
<i>Brassica oleracea</i> L., Brassicaceae	Khaphetshu	Leaves	Leafy vegetables	0.03
<i>Caesalpinia decapetala</i>	Bobo	Fruits	Edible fruits	0.20
<i>Daucus carota</i> L., Apiaceae	Umqatha, Kharothi	Taproot	Edible taproot	0.04
<i>Diospyros lycioides</i> Desf., Ebenaceae	Umbhongisa	Fruits	Edible fruits	0.13
<i>Dovyalis rhymnoides</i> (Burch ex DC.) Burch. ex Harv. and Sond., Salicaceae	Umkhmgwinqi	Fruits	Edible fruits and used as beverage	0.15
<i>Grewia occidentalis</i> L. Malvaceae	Umqaqombo	Fruits	Edible fruits	0.16
<i>Opuntia ficus-indica</i> (L.) Mill., Cactaceae	Tolofya	Fruits	Edible fruits	0.07
<i>Punica granatum</i> L., Lythraceae	Rhanati	Fruits	Edible fruits	0.19
<i>Prunus persica</i>	Ipesika	Fruits	Edible fruits	0.31
<i>Psidium guajava</i>	Gwava	Fruits	Edible fruits	0.36
<i>Rubus fruticosus</i> L., Rosaceae	Qunube	Fruits	Edible fruits, wine production and beverage	0.17
<i>Solanum nigrum</i>	Umsobo	Leaves and berries	Edible fruits and leafy vegetable	0.43
<i>Spinacia oleracea</i> L., Amaranthaceae	Spinach	Leaves	Leafy vegetable	0.09
<b>Forage</b>				
<i>Acacia mearnsii</i> De Wild., Fabaceae	Uwatile	Leaves	-	0.35
<i>Cenchrus ciliaris</i> L., Poaceae	Phungela	Whole plant	-	0.07
<i>Datura stramonium</i>	Ijoyi and umhlavavuthwa	Leaves	-	0.94
<i>Digitaria eriantha</i> Steud., Poaceae	Ulozana	Whole plant	-	0.08
<i>Diospyros lycioides</i>	Umbhongisa	Leaves	-	0.13
<i>Opuntia ficus-indica</i>	Tolofya	Fruits	-	0.07
<i>Punica granatum</i>	Rhanati	Leaves	-	0.19
<i>Yachellia karroo</i> (Hayne) Banfi and Glasso, Fabaceae	Umnqa	Leaves	-	0.26
<b>Firewood</b>				
<i>Acacia mearnsii</i>	Watile	Stems and twigs	-	0.35
<i>Aloe ferox</i>	Ikhala and umhlaba	Leaves and stems	-	0.40
<i>Aloe vera</i>	Intlaba	Leaves	-	0.31
<i>Caesalpinia decapetala</i>	Bobo	Stems	-	0.20
<i>Datura stramonium</i>	Ijoyi and umhlavavuthwa	Stems	-	0.94
<i>Diospyros lycioides</i>	Umbhongisa	Stems	-	0.13
<i>Punica granatum</i>	Rhanati	Stems	-	0.19
<i>Prunus persica</i>	Ipesika	Stems	-	0.31
<i>Psidium guajava</i>	Gwava	Stems	-	0.36
<i>Yachellia karroo</i>	Umnqa	Stems and twigs	-	0.26
<b>Ceremonial</b>				
<i>Helichrysum pedunculatum</i>	Impepho	Leaves and stems	Dried incense is burnt during ceremonial services	0.15
<i>Helichrysum odoratissimum</i>	Impepho and isiqhumiso	Leaves and stems	Dried incense is burnt during ceremonial services	0.49

Table 1: Continue

Scientific name and family	Xhosa name	Part(s) used	Uses	RFC
<b>Construction materials</b>				
<i>Acacia mearnsii</i>	Uwatile	Stems and twigs	Animal enclosures and roof trusses	0.35
<i>Aloe ferax</i>	Ikhala, Umhlababobo	Leaves and stems	Animal enclosures	0.40
<i>Caesalpinia decapetala</i>	Bobo	Stems	Animal enclosures	0.20
<i>Elegia tectorum</i> (L.f.) Moline and H.P. Linder, Restionaceae	Ingcongolo	Whole plant	Building houses and thatching	0.06
<i>Typha capensis</i>	Umnga	Leaves	Building houses	0.30
<i>Vachellia karroo</i>	Umnga	Stems and twigs	Fencing and roof trusses	0.26
<b>Bushmeat</b>				
<i>Aepyceros melampus</i> Lichtenstein, Bovidae	Impala	Whole animal	Bushmeat	0.60
		Skin	Leathers and coats	
		Horns	Decorative material and making musical instruments	
<i>Lepus timidus</i> L., Leporidae	Mvundla	Whole animal	Bushmeat	0.32
		Skin	Leathers, coats, bags and fur	
<i>Meleagridinae gallopavo</i> L., Phasianidae	Karikwini	Whole animal	Bushmeat	0.11
<i>Numida meleagris</i> L., Nimididae	Mpangela	Whole animal	Bushmeat	0.29
<i>Oryctolagus cuniculus</i> L., Leporidae	Mvolovu	Whole animal	Bushmeat	0.33
		Skin	Fur, coats and bags	
<i>Pavo cristatus</i> L., Phasianidae	Plikoko	Whole animal	Bushmeat	0.75
		Feathers	Decorative material and feather duster	
<i>Rhombosargus holobi</i> Steindachner, Sparidae	Fishi	Whole animal	Bushmeat	0.03
<i>Struthio camelus</i> L., Struthionidae	Ncimiba	Whole animal	Bushmeat	0.61
		Feathers	Feather duster and decorative material	
<i>Xerus inauris</i> Hemprich and Ehrenberg, Scuridae	Itschozi	Whole animal	Bushmeat	0.76
		Skin	Fur and bags	
<b>Other miscellaneous uses</b>				
<i>Agaphanthus africanus</i>	Isicakathi	Whole plant	Ornamental plant	0.85
<i>Dicerotherium rhinocerotis</i>	Umlingatho	Leaves and roots	Fumigant	0.69
<i>Helichrysum odoratisimum</i>	Impepho and isiqhumiso	Leaves and stems	Fumigant and insect repellent	0.49
<i>Typha capensis</i>	Ingcongolo	Leaves	Brooms and crafts	0.30



Table 2: Uses of different NTFPs reported by people living in Alfred Nzo District Municipality

NTFP use	Response (%)
Herbal medicines	86.3
Wild foods	77.4
Construction materials	54.8
Firewood	51.6
Sales of raw and manufactured products	49.2
Forage for livestock	26.6
Fibres for crafts, baskets, mats and brooms	16.9
Environmental protection	9.7
Aesthetic, cultural and spiritual values	7.3
Wood for household and farming implements	4.0

Some respondents indicated more than one use

Table 3: Views on population dynamics and conservation needs of NTFPs by participants in Alfred Nzo District Municipality

Question	Response (%)
Are NTFPs availability increasing?	0.0
Are NTFPs availability decreasing?	92.7
<b>What did the interviewee believe was the cause of any perceived increase or decrease in availability of NTFPs?</b>	
Over-collection	23.4
Deforestation	14.5
Drought	16.1
Land clearing for settlement and cultivation	11.3
Destructive collection practices	6.5
Excessive commercial harvesting	9.7
Illegal bushmeat hunting and poaching	10.5

Some participants gave multiple answers

26.6%. Interviews with participants revealed that some members of the community use fibre to make crafts, baskets, mats and brooms (16.9%). Other environmental goods and services which scored less than 10% included environmental protection (9.7%), aesthetic, cultural and spiritual values (7.3%) and the use of wood for household and farming implements by some households (4.0%).

All the participants interviewed claimed to have used NTFPs in one form or the other to satisfy their livelihood needs, with almost all participants (92.7%) reporting that the availability of NTFPs were declining in Alfred Nzo district municipality (Table 3). The factors responsible for the decline in NTFPs were both anthropogenic (over-collection, deforestation, land clearing for settlement and cultivation, destructive collection practices, excessive commercial harvesting, illegal bushmeat hunting and poaching) and drought. Over-collection of NTFPs (23.4%), drought (16.1%), deforestation (14.5%), land clearing for settlement and cultivation (11.3%), illegal bushmeat hunting and poaching (10.5%) were mentioned as the main causes of the decline of NTFPs. A small proportion of the participants (9.7%) felt that NTFPs were declined due to excessive commercial

harvesting and 6.5% of the participants argued that destructive collection practices were responsible for the decline of NTFPs. Participants also mentioned that the use of NTFPs is declining due to availability of modern substitutes, but some of the crafts and firewood were still used during cultural events such as marriages and other traditional ceremonies. There was a general consensus that the current level of usage of NTFPs is not sustainable and recommended education aimed at promoting sustainable management of these natural resources.

## DISCUSSION

Results of the present study showed that the majority of NTFPs in Alfred Nzo District Municipality (39.0%) were used as herbal medicines, followed by edible plants and mushroom (18.0%), firewood (11.0%), bushmeat (10.0%), forage (9.0%), construction material (6.0%), ceremonial uses (2.0%) and others with miscellaneous uses (5.0%). Interviews with participants revealed that there is a decline in the availability of NTFPs mainly due to both anthropogenic (over-collection, deforestation, land clearing for settlement and cultivation, destructive collection practices, excessive commercial harvesting, illegal bushmeat hunting and poaching) and natural drought. Not only do NTFPs supplement vitamins, proteins, minerals and the nutritional requirements of the communities, they also diversify their diets and enhance their seasonal food balance<sup>5,19</sup>. Unfortunately, the extraction of NTFPs from natural habitats has limited potential for improving food security and nutrition of households since this is obviously unsustainable<sup>20</sup>. Findings from the current study confirmed the argument by another report that medicinal plants are an important aspect of the daily lives of many people and an important part of the South African cultural heritage<sup>21</sup>. In another research it was showed that edible fruits play an important role in food and nutritional security in Namibia and Zimbabwe, particularly among marginalized groups with the diversity of edible fruits offering variety in household diet, also serving as supplementary sources of food, seasonal food and as emergency food during times of famine when normal food supply mechanisms are disrupted<sup>22</sup>. It was already published that rural children in South Africa snack extensively on a remarkable diversity of wild fruits across the seasons, which provide an important source of vitamins, minerals, amino acids and trace elements<sup>23</sup>. The contribution that these edible fruits make to maintaining health and preventing disease is generally unrecognized, but may well

be of survival value among impoverished people subsisting mainly on maize (*Zea mays* L.) and during seasons when other food is scarce<sup>23</sup>. Similarly, it was found between 7.1 and 13.9% of households in Dyala village in the Eastern Cape and Dixie village in the Limpopo province, South Africa use bushmeat as a rural safety-net irrespective of household wealth or gender<sup>13</sup>. It was also argued by another researcher that bushmeat offer households a long-term solution to food insecurity, helping households to cope with periods of vulnerability<sup>24</sup>. Research carried out in Phnom Kok community in Cambodia, revealed that bushmeat is gathered and traded at local and regional markets and this NTFP is usually destined for urban consumers<sup>25</sup>. However, it was highlighted that the unsustainable use of bushmeat is a matter of concern, not only for conservation, but also because the depletion of this NTFP may exacerbate food insecurity, vulnerability and poverty<sup>26</sup>.

For centuries, firewood has served as source of energy for both cooking and heating in several countries. For example, it was indicated that over 80% of rural households still use firewood as their primary source of energy<sup>27</sup>. Hence, the majority of households in Alfred Nzo district municipality prefer to use firewood for cooking rather than electricity. Research done by few scientists showed that more than 90% of households in Dyala village in the Eastern Cape and Dixie village in the Limpopo province, South Africa use firewood for cooking and heating<sup>13</sup>. It was already reported that firewood and charcoal trade are the largest and most integrated form of the NTFPs product markets, representing a major source of cash income and employment for the many rural poor<sup>28</sup>. Firewood is one of the important NTFPs in Africa, with 92% of rural households in Tanzania using firewood as their main cooking fuel and over 50% of the urban population using charcoal<sup>29</sup>. In addition to timber extraction, the production of building poles, charcoal and firewood have led to over exploitation of forests and is one of the main immediate drivers (alongside agricultural expansion) of forest degradation and deforestation in Tanzania<sup>30</sup>. Research carried out in Sapele local government area of Delta state, Nigeria, showed that 13.3% of the documented NTFPs were construction materials<sup>31</sup>. Research carried out in Mbulu and Babati districts in Manyara region in Tanzania showed that 40% of the documented NTFPs were construction materials<sup>32</sup>. The collection of NTFPs for house construction and household use is widespread in sub-saharan Africa, driven by poverty and a lack of means to invest in better quality housing and non-wood substitute products<sup>29</sup>. Therefore, NTFPs form an

integral part of the rural economy where the majority of the rural populations live especially those living in rural and marginalized areas<sup>5,19,20</sup>.

## **CONCLUSION**

This study has expanded the current knowledge of NTFPs used by local communities in South Africa. The importance of NTFPs to livelihood strategies of households in the study area has been emphasized, with households showing dependence on NTFPs for diverse livelihood needs. A better understanding of the importance and sustainable use of NTFPs can ensure and empower local community members through improved livelihoods. For widely used plant NTFPs such as herbal medicines, sustainable utilization can be achieved by encouraging and supporting their domestication in home gardens. Moreover, the efficient and sustainable use of such natural resources can contribute to natural resources management, ecosystem productivity and cycling of ecosystem goods and services.

## **SIGNIFICANCE STATEMENT**

This study discovered that 59 species were used as NTFPs in Alfred Nzo District Municipality in the Eastern Cape Province in South Africa. The documented NTFPs provided households with 8 categories which included herbal medicines, edible plants and mushroom, firewood, bushmeat, forage, construction materials, ceremonial uses and others with miscellaneous uses. Results of this study added valuable literature on NTFPs diversity, their consumption patterns and contribution to rural income and this information may enable government officers and policy planners to accurately plan sustainable management of NTFPs resources and community development in near future. Such information about NTFPs has high implications for long term management of goods and services derived from NTFPs.

## **ACKNOWLEDGMENT**

The authors would like to express their gratitude to the National Research Foundation (NRF), South Africa (grant number T398) and Govan Mbeki Research and Development Centre (GMRDC), University of Fort Hare (grant number C169) for financial support to conduct this study. The authors are also grateful to residents of Alfred Nzo district municipality who shared their knowledge on NTFPs.

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